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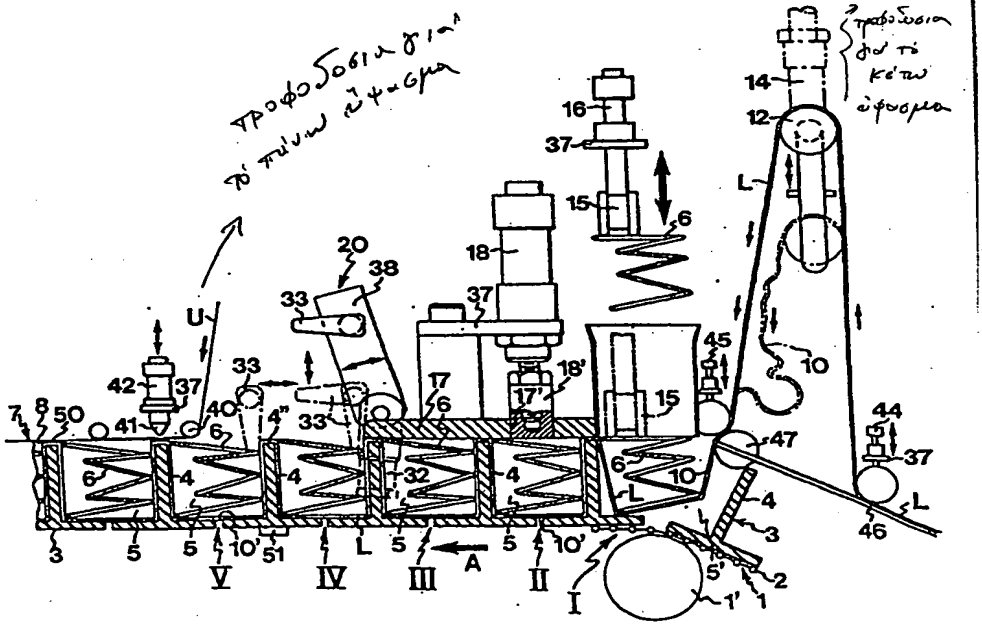
(54) Title: METHOD AND MACHINE FOR MAKING A SPRING-MATRESS WEB AND A SPRING-MATTRESS WEB

(57) Abstract

A method of making a mattress web comprising two fabric webs which are attached to one another in the transverse direction by seams that are spaced apart in the longitudinal direction, thereby to form sleeves, each of which contains a slightly tensioned spring. One of the fabric webs is continuously conveyed in its longitudinal direction in such a manner as to be supported from below, and a curve is formed in the transverse direction of the web, the curve opening facing upwards. A spring is introduced into the curve through the opening thereof, the spring being non-tensioned and having a height exceeding the curve depth. In the curve, the spring is compressed in the vertical direction under the action of a force acting at a distance from the downstream wall of the curve, and the curve with the compressed spring therein is brought together with the other fabric web, which is continuously conveyed in its longitudinal direction. The other fabric web is attached to the downstream edge of the curve, and the spring-compressing force is cancelled while the top fabric is kept close to the opening of the curve. A machine for implementing the method comprises: an endless conveyor (1) which has an essentially horizontal run and which substantially consists of equidistant and parallel grooves (5) extending transversely of the direction of conveyance; means for stepwise propelling of the conveyor by the width of a groove; means (45, 47) for feeding a mattress bottom fabric (L) to the horizontal run of the conveyor, such that an upwardly open curve of this fabric is formed in the groove; and means (15, 16; 28, 32, 33; 40; 41, 42) for performing the steps described above with regard to the method.



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Method and machine for making a spring-mattress web and a spring-mattress web.

This invention concerns a method and an machine for making a spring-mattress web. The invention further relates to a mattress web made in the inventive machine in accordance with the inventive method.

WO 91/05732 teaches a method and a machine for encapsulating elongate springs between two fabric webs, thereby to produce a mattress web.

One drawback of this prior-art technique is that, when the shuttle by means of which a spring is introduced between the fabric webs is retracted, there is a considerable risk that the friction between the shuttle and the spring as well as between the webs and the spring will stretch the spring in its longitudinal direction, such that the spring will, when trying to revert to a non-tensioned state, contract or crease the webs. As a result, the webs have to be stretched in the transverse direction in the mattress web or in the mattress blank separated from the mattress web, which is a costly operation.

The object of this invention is to provide a method and a machine which do not suffer from this drawback. This object is achieved by the method and the machine set forth in the appended claims.

A mattress web made in the inventive machine in accordance with the inventive method is encompassed by the protective scope of the appended claims directed to a mattress web. A mattress cut off from such a mattress web is, owing to the fact that its bottom fabric and top fabric are connected to one another on the one side of the web, more flexible and, hence, more comfortable than a mattress made from the mattress web according to WO 91/05732, whose spring-accommodating sleeves are attached to one another at the middle.

Thus, the basic inventive idea is that the spring is to be introduced, in non-tensioned state and in its longitudinal direction, into a curve or pocket formed in a fabric web and that the curve with the spring therein is to be closed by means of the other fabric web, such that the spring is slightly compressed, as it should be in the mattress web, but however is non-tensioned in its longitudinal direction, resulting in the elimination of the fabric-creasing forces arising in the prior-art technique.

The invention will now be described in more detail with regard to an embodiment of a machine for implementing the inventive method. In the accompanying drawings,

Fig. 1 is a partly sectional and partly schematic side view of the machine, and

Fig. 2 is a view of a spring-holder device.

Thus, the illustrated machine comprises an endless conveyor belt 1, which is made up of chains 2 and T-sections 3 which with their crossbars are connected to the chains in the transverse direction of the conveyor belt, such that the stems 4 of the T-sections point upwards in the upper run of the belt. The chains are driven by chain wheels (not shown) and a motor in unison fashion with an indexed movement, the step length corresponding to the width of grooves 5 of equal width formed between two successive T-sections 3.

During its indexed movement, the conveyor belt 1 travels in the direction indicated by the arrow A past stations I-V, the mutual distance of which is an indexation step.

The conveyor belt 1 conveys a bottom fabric L and springs 6 from station I to station V. After station V, the conveyor belt conveys a finished mattress web 7, in which parallel sleeves 8 arranged in the transverse direction of the belt each contains a spring 6, which is slightly compressed in the vertical direction. These sleeves are formed of the bottom web L and a top web U,

which are attached to one another in the transverse direction of the conveyor belt. Lengths of the mattress web can be cut off between the sleeves 8 in order to produce mattress blanks, the ends of the sleeves being sealed in some suitable manner to form a finished mattress.

Here follows a description of the passage of a groove, a curve and a spring from station I to station V.

The bottom web L is conveyed to station I from a freely rotatable storage roller (not shown). In station I, the bottom web is formed with a downwardly-bulging curve 10 in the groove 5'. The groove is not fully formed here, and the conveyor belt here passes from an angle portion (guide roller 1') to a horizontal run. In the angle portion, two successive T-sections move towards one another, so that their stems 4 will form the flanges of the fully-formed U-shaped groove 5. This angular closing of the stems of the T-sections entails that the formation of the curve of the bottom web need not be excessively precise, i.e. the curve will in reliable fashion be placed in the groove 5.

The curve 10 of the bottom web is formed by moving a guiding bar 12, over which the bottom web travels, from an upper position, in which the bottom web is stretched, to a lower position, in which the bottom web is slack and forms the curve 10. The displacement is brought about by a piston and cylinder arrangement 14, whose stroke length is such that the curve 10 of the bottom web will, in stretched state, have a width corresponding to the width of the groove when in stretched state.

As a result of the upward displacement of the guiding bar 12, a new length of the bottom web of the indicated width is retrieved from the storage roller.

In the curve 10 thus formed in station I is introduced a metallic mattress spring in the vertical direction through the upwardly open curve opening. To this end, an electromagnet 15 is attached to a vertically

reciprocating piston and cylinder arrangement 16. The electromagnet 15 is adapted to retain the spring during the downward stroke of the piston and cylinder arrangement 16 and to let go of the spring at the end of this downward stroke, when the piston and cylinder arrangement 16 compresses the spring 6, which is supported by the bottom of the groove 5' being formed.

At the end of the downward stroke, the conveyor belt 1 has further begun its indexation movement downstream towards station II and conveyed the groove 5' with its bottom-web curve and the compressed spring 6 therein under the bevelled upstream end 17 of a stationary sole plate 17. The sole plate 17 covers the groove (with the curve and spring therein) in the two following stations II and III with a slide fit therebetween, i.e. between the bottom web portion laid over the stems 4 and the top surface of the slightly compressed spring 6.

In station II, the groove 5' is fully formed (parallel side walls 4, reference numeral 5) and the curve 10 is stretched where it closely follows the side walls and the bottom of the groove, thus forming a pocket 10'. To this end, there is provided a vertically reciprocating piston and cylinder arrangement 18, which supports a bar 18' adapted to run through an opening 17' in the sole plate 17, so as to compress the spring 6 against the bottom of the curve in such a manner that it is supported by the bottom of the groove, so that the curve will be brought to its stretched state to form the rectangular pocket 10', and the fabric portion in station III is prevented from moving backwards (against the direction of the arrow A).

In station III, there are not taken any steps affecting the bottom web pocket 10' or the spring 6, but the station merely serves to stabilise the stretched shape of the pocket.

In station IV, the groove 5 and the pocket 10' therein are again open, and the spring is thus in non-

tensioned state, such that its upper surface projects somewhat above the openings of the groove and the pocket. In this station, the pocket is prepared for closing by means of the top web, thereby to form the sleeve 8 containing the slightly compressed spring.

A piston and cylinder arrangement 30 (Fig. 2) is adapted to vertically reciprocate a strip holder 31; a piston and cylinder arrangement 32 is adapted to reciprocatingly pivot a spring-compressing strip 33 about an axis parallel to its one edge; and a piston and cylinder arrangement 35 is adapted to return the strip holder 31 to the neutral position.

The strip holder 31 is slidably mounted for vertical motion in the machine frame. The strip holder is mounted in the machine frame 37 by means of the piston and cylinder arrangements 30 and 35 as well as a rod 36. The piston and cylinder arrangement 30 is hingedly connected to the machine frame 37 at its lower end and is hingedly connected to the strip holder 31 at its upper end. The piston and cylinder arrangement 35 and the rod 36 are hingedly connected to the machine frame 37 at their respective ends. The piston and cylinder arrangement 32 is hingedly connected to the strip holder 31 and a link 32, to which the strip 33 is fixedly connected.

The piston and cylinder arrangement 35 is associated with a pressure-relief valve open in the central position.

The spring holder 20 operates as follows. The starting point is the neutral position illustrated in Figs 1 and 2 by full lines.

In station IV, the piston and cylinder arrangement 30 is, in a first step, activated so as to displace the strip holder 31 to a working position, which is indicated by dashed lines in Fig. 1. Then, the piston and cylinder arrangement 32 is, in a section operation, activated so as to pivot the strip 33 from its resting position to an active position, which is indicated by dashed lines in

Fig. 1 and in which the strip with its front edge is applied against the upper surface of the spring, such that the spring is compressed in the pocket 10' against the bottom of the groove. The upper surface of the spring is then located below the openings of the pocket and the groove. Then, the pressure-relief valve of the piston and cylinder arrangement 35 is, in a third operation, activated so as to relieve the pressure of this arrangement, to enable to the conveyor belt 1 to entrain, in its next indexation step, the spring holder 20 by support engagement between the strip 33 and the upstream wall 4 of the groove 5.

This next indexation step moves the pocket 10' in the groove 5, the spring being pressed down in the pocket by the strip 33 of the spring holder, to station V, which is a welding station.

The top web is conveyed from a free-rolling storage roller (not shown) to the welding station via guide rollers 40. The bottom web L and the top web U are welded together by means of a vertically reciprocating welding rod 41, e.g. inductively heated, under the action of a piston and cylinder arrangement 42 mounted in the machine frame. This produces a linear welding joint 50 between the top and bottom webs, the downstream upper edge 4" of the groove and a support 51 acting as abutments.

After welding and cooling, the piston and cylinder arrangement 30 is caused to return the strip 33 to its resting position, and the piston and cylinder arrangements 32, 35 are caused to return the strip holder 31 to its resting position. The guide roller 40 is disposed above the pocket opening in proximity thereto, such that it and the top web contribute to keeping the spring 6 in place in the pocket.

The piston and cylinder arrangement 16 with the magnet 15 attached thereto is reciprocatingly displaceable also perpendicularly to its vertical direction of move-

ment (for instance into and out of the plane of the drawing) in order to collect a spring 6 from a store.

At the inlet site for the bottom web L to the station I, there is provided a nip-producing piston and cylinder arrangement 44, 45 for this web on both sides of the rod 12. These arrangements operate alternatingly and concurrently with the vertical strokes of the rod in order to let go and nip the bottom web in cooperation with abutments 46, 47.

It is evident from the foregoing that the height of the spring 6, when the spring is non-tensioned in the vertical direction, slightly exceeds the height of the pocket 10. WO 90/01285 teaches a suitable spring (see Fig. 1).

Also, it goes without saying that the material of the bottom and top webs L, U are of weldable type, such as plastic fabric. However, the invention encompasses other methods than welding for connecting these webs, such as sewing.

CLAIMS

1. A method of making a mattress web comprising two fabric webs which are attached to one another in the transverse direction by seams that are spaced apart in the longitudinal direction, thereby to form sleeves, each of which contains a slightly tensioned spring, characterised in that

— one of said fabric webs is continuously fed in its longitudinal direction in such a way as to be supported from below,

— a curve is formed in the web in its transverse direction, the curve opening facing upwards,

— a spring is introduced into the curve through the opening thereof, said spring being non-tensioned and having a height exceeding the curve depth,

— the spring is vertically compressed in the curve under the action of a force acting at a distance from the downstream wall of the curve,

— the curve with the compressed spring therein is brought together with the other fabric web, which is continuously fed in its longitudinal direction,

— the other fabric web is attached to the downstream edge of the curve, and

— the spring-compressing force is cancelled while the upper fabric is kept close to the opening of the curve.

2. A method as claimed in claim 1, characterised in that the upstream edge of the curve is, during the compression of the spring, prevented from moving in the downstream direction of the curve.

3. A method as claimed in claim 1 or 2, characterised in that the downstream edge of the curve is, during the compression of the spring, prevented from moving in the upstream direction of the curve.

4. A method as claimed in any one of claims 1-3, characterised in that the shape of the curve

is stabilised to the shape of said sleeve by compression of the spring.

5. A method as claimed in any one of claims 1-4, wherein the fabrics are made of or contain thermoplastic, c h a r a c t e r i s e d in that the fabric webs are attached to one another by welding.

6. A machine for making a mattress web comprising two fabric webs (L, U) which are attached to one another by spaced-apart seams (50), thereby to form sleeves (8), each of which contains a slightly tensioned spring (6), c h a r a c t e r i s e d by

— an endless conveyor which has an essentially horizontal run and which substantially consists of equidistant and parallel grooves (5) extending transversely of the direction of conveyance,

— means for stepwise propelling of the conveyor by the width of a groove,

— means (45, 47) for feeding a mattress bottom fabric (L) to the horizontal run of the conveyor, such that an upwardly open curve of this fabric is formed in the groove,

— means (15, 16) for introducing an elongate spring (6) into the curve, said spring having a height exceeding the height of the curve as well as a width essentially equal to the width of the groove, and further being resilient in the vertical direction,

— means (28, 32, 33) for compressing the spring in the curve, the spring being supported by the bottom of the groove, close to the upstream wall of the curve,

— means (40) for feeding a top fabric (U) to the conveyor, such that the top fabric (U) encounters the downstream edge of the curve,

— means (41, 42) for attaching the bottom fabric portion on the downstream edge of the groove to the top fabric,

— means (28, 32) for cancelling the effect of the spring-compressing means after said attachment means have fulfilled their task, and

— means (40) for keeping the top fabric (U) close to the opening of the groove as the effect of the spring-compressing means is cancelled.

7. Machine as claimed in claim 6, c h a r a c - t e r i s e d by additional means (17', 18, 18') for compressing the spring (6) in order to stabilise the shape of the curve to the shape of the groove.

8. A machine as claimed in claim 6 or 7, c h a r - a c t e r i s e d in that the grooves (5) are formed of two inverted T-sections (3), said feeding means (42, 47) being disposed in the vicinity of the beginning of the horizontal run of the conveyor.

9. A mattress web comprising an elongate top fabric (U) and an elongate bottom fabric (L), said fabrics being attached to one another at certain intervals in the longitudinal direction, such that there are formed spaced-apart sleeves (8) which are transverse to the longitudinal direction of the fabrics and which contain biased mattress spring means, c h a r a c t e r i s e d in that the top fabric and the bottom fabric are attached to one another in a plane essentially coinciding with the one lateral plane of the mattress web.

10. A mattress web as claimed in claim 9, wherein the top and the bottom web are made of thermoplastic material, c h a r a c t e r i s e d in that the top and the bottom fabric are attached to one another by welding.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 96/00449

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B68G 9/00, A47C 27/04
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B68G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4523344 A (W. STUMPF ET AL), 18 June 1985 (18.06.85), column 2, line 40 - line 62, figures 3, 6,7	9,10
A	US 1861429 A (B.R. SCHNEIDER ET AL), 31 May 1932 (31.05.32), page 1, line 28 - line 70, figures 1,3, 7,8	1,6

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Information on patent family members

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US-A- 1861429	31/05/32	NONE	